

## **Field of the Invention**

**[0001]** This invention relates to a backpack, and more particularly to a backpack that is configured to be more comfortable when carrying a load.

## **5 Background of the Invention**

**[0002]** Backpacks are commonly used for carrying loads for many different purposes. Students, for example, use backpacks to carry books to and from school. Hikers, for example, use backpacks to carry hiking gear and food, during hikes.

10 **[0003]** Several problems have persisted with the design of backpacks, however. For example, under some conditions, some people perspire while wearing a backpack on their back. Due to the close contact that typically occurs between the backpack and the back of the wearer, the perspiration is typically absorbed by the shirt of the wearer and is not  
15 permitted to evaporate. This, in turn, can lead to eventual discomfort as the moisture accumulates in the wearer's shirt. Furthermore, this can be embarrassing to the wearer once the backpack is removed, depending on the environment. For example, if the wearer is wearing the backpack on the way to school, it is desirable that the shirt of the wearer be relatively dry  
20 when the backpack is removed.

**[0004]** Another problem that persists is that of comfort and back-stress, which are related to each other in many cases. Reference is made to Figure 1, which shows a typical backpack 10 of the prior art, in which a load 12 is contained. A typical backpack, such as backpack 10, can sags  
25 when carrying a load 12. This sagging causes the load 12 to shift position and the result is typically that the load 12 is moved further away from the back 14 of the wearer 16. The moment exerted on the wearer by a load is dependent on the force exerted by the load and the distance between the load and the location of the support for the load, i.e. the back 14 and  
30 shoulders 17 of the wearer 16. The distance, is shown as D1 between the load 12 and the back 14, plus the distance Ds from the back 14 to the middle of the shoulders 17. Thus, the moment M1 exerted by the load 12

on the back 14 of the wearer 16 is equal to the force  $F1 \times D1$ . Because the sagging of the backpack causes the load 12 to move farther away from the back 14 of the wearer 16, the moment  $M1$  is increased. This, in turn, causes increased stress on the back 14 and shoulders of the wearer 16, and ultimately makes the backpack 10 less comfortable. It will be understood that this is a simplification of the calculation of the actual moment exerted on the back 14 and shoulders 17. Nonetheless, it is useful to illustrate the problem.

**[0005]** Another problem incurred with the backpack 10 of the prior art, is illustrated in Figure 2. A problem that is at least in part related to the moment exerted by the backpack 10 on the back 14 of the wearer 16, is that the lumbar region 18 of the back 14 exerts a force  $F2$  against the backpack 10 as a result of the position of the load (not shown) carried therein in relation to the back 14.

**[0006]** Another problem with backpacks of the prior art relates to the shoulder straps. Shoulder straps of the prior art typically extend generally linearly, and as a result, one edge of the shoulder straps tends to exert more pressure on the shoulders of the wearer than is exert elsewhere across the width of the shoulder strap. This means that, in spite of the shoulder strap having a width that might appear generous, only a fraction of the width of the shoulder strap is supporting the backpack on the shoulder of the wearer.

**[0007]** In general, there is a continuing need for backpacks that are more comfortable or that reduce the back-stress caused to the wearer during use.

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### **Summary**

**[0008]** In a first aspect, the invention is directed to a backpack, comprising a backpack body and at least one shoulder strap. The backpack body defines at least one storage compartment. The backpack body has a back-facing face. The back-facing face having at least one air channel defined thereon. The at least one air channel has at least one opening at the periphery of the back-facing face. The at least one shoulder strap is

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connected to the backpack body. The at least one shoulder strap is adapted for mounting the backpack on a wearer.

**[0009]** In a second aspect, the invention is directed to a backpack, comprising a backpack body and at least one shoulder strap. The backpack body defines at least one storage compartment. The backpack body has a back-facing face. The back-facing face has at least one air channel defined thereon. The at least one air channel is fluidly connected to ambient air when the backpack is worn by a wearer. The at least one shoulder strap is connected to the backpack body. The at least one shoulder strap is adapted for mounting the backpack on a wearer.

**[0010]** In a third aspect, the invention is directed to a backpack, comprising a backpack body and at least one shoulder strap. The backpack body defines at least one storage compartment. The backpack body has a back-facing face. The back-facing face has a channel defined thereon. The channel is positioned to face the spine of a wearer when in use, and is sufficiently deep so as to avoid contact with the spine of the wearer when in use. The at least one shoulder strap is connected to the backpack body. The at least one shoulder strap is adapted for mounting the backpack on a wearer.

**[0011]** In a fourth aspect, the invention is directed to a backpack, comprising a backpack body, at least one cushion and at least one shoulder strap. The backpack body defines at least one storage compartment. The backpack body has a back-facing face. The at least one shoulder strap is connected to the backpack body. The at least one shoulder strap is adapted for mounting the backpack on a wearer. The at least one cushion is positioned on the back-facing face, so that when the backpack contains a load and is worn by the wearer, the cushion distributes at least a portion of the weight of the load over a portion of the back of the wearer.

**[0012]** In a fifth aspect, the invention is directed to a backpack, comprising a backpack body, at least one cushion and at least one shoulder strap. The backpack body defines at least one storage compartment having a bottom. A bottom board is positioned at the bottom. The bottom board is

at least semi-rigid. The bottom board is angled upwards in a direction away from the back-facing face. The backpack is configured to maintain the bottom board generally in the direction when the backpack contains a load therein. The at least one shoulder strap is connected to the backpack body.

- 5 The at least one shoulder strap is adapted for mounting the backpack on a wearer.

#### **Brief Description of the Drawings**

- 10 [0013] Reference will now be made by way of example to the accompanying drawings, showing articles made according to preferred embodiments of the present invention, in which:

[0014] Figure 1 is a side view of a person wearing a first backpack of the prior art wherein a load being carried inside the backpack is shown;

- 15 [0015] Figure 2 is a side view of a person wearing a second backpack of the prior art;

[0016] Figure 3 is a side view of a backpack in accordance with a first embodiment of the present invention, shown being worn by a wearer, and wherein a load being carried inside the backpack is shown;

- 20 [0017] Figure 4 is a side view of the backpack shown in Figure 3, with some internal structure shown;

[0018] Figure 5 is a top view of the backpack shown in Figure 3, shown being worn by the wearer;

[0019] Figure 6 is a side view of the backpack shown in Figure 3, with the back of the wearer;

- 25 [0020] Figure 7 is a perspective view of the backpack shown in Figure 3, with some portions removed for clarity; and

[0021] Figure 7a is a perspective view of the backpack shown in Figure 3.

**Detail d Description of the Drawings**

[0022] Reference is made to Figure 3, which shows a backpack 20 in accordance with a first embodiment of the present invention. The backpack 20 is configured to reduce stress on the back 22 of the wearer 24. The backpack 20 is also configured to permit airflow to the back 22 of the wearer 24.

[0023] The backpack 20 includes a backpack body 26 and two shoulder straps 27. The backpack body 26 has at least one storage compartment 28 therein for receiving a load 30 and provides access to the compartment 28 by any suitable means, such as a zipper 29. The backpack body 26 includes a back-facing face 32, an away-facing face 34 that is generally opposed to the back-facing face 32, a top face 36, a bottom face 38 and two side faces 40 and 42 (see Figure 5).

[0024] Referring to Figure 7, the back-facing face 32 has a top 44, a bottom 46, and two sides 48 and 50. A first channel 58 and a second channel 60 are defined in the back-facing face 32. The first channel 58 may have an opening 62 positioned somewhere on the periphery of the back-facing face, such as at the top 44 and may communicate with the second channel 60 at a junction 64. The second channel 60 may extend generally horizontally between a first opening 66 on the first side 48 to a second opening 68 on the second side 50. The first and second channels 58 and 60 permit ambient air to contact at least a portion of the back 22 of the wearer 24, while the backpack 20 is being worn. The contact of air with the back 22 facilitates the evaporation of moisture that can occur as a result of perspiration. Thus, the first and second channels 58 and 60 facilitate cooling of the back 22 and of the wearer 24 overall during wearing of the backpack 20.

[0025] The presence of multiple openings, such as openings 64, 66 and 68 permit a greater degree of air circulation through the first and second channels 58 and 60. It will be appreciated that more or fewer openings may be incorporated into the channel system formed by channels 58 and 60. For example, the channels 58 and 60 may together communicate with a single

opening in an alternative embodiment that is not shown, however, this would reduce the air flow into and out of the channels 58 and 60.

**[0026]** It will also be appreciated that there may be more or fewer channels in the back-facing face 32, instead of the two channels 58 and 60.

5 In general, however, fewer channels would provide reduced air flow to the back 22. Conversely, more channels would provide greater air flow to the back 22.

**[0027]** The first channel 58 may extend generally vertically along the back-facing face 32 of the backpack 20 and may have sufficient depth so as  
10 to inhibit contact between the backpack 20 and the spine 70 of the wearer 24 (see Figure 5). Reducing contact between the backpack 20 and the spine 70 makes the backpack 20 more comfortable to wear and reduces a source of stress on the wearer 24. To perform the function of inhibiting  
15 contact with the back 22 of the wearer 24, the first channel 58 may be a closed channel, in an alternative embodiment that is not shown. In other words, in this alternative embodiment, the first channel 58 is not required to be in fluid communication with the ambient air, since its main function is to inhibit contact between the backpack 20 and the spine 70.

**[0028]** The second channel 60 may be generally horizontal as shown  
20 in the figures. Alternatively, the second channel 60 may have any configuration that is suitable to provide airflow to portions of the back 22. The second channel 60 may also be fluidically separate from the first channel 58, in an alternative embodiment that is not shown.

**[0029]** The back-facing face 32 of the backpack 20 may have a  
25 plurality of cushions thereon. For example, there may be a lumbar cushion 72, which may also be referred to as a lumbar support pad 72, and first and second upper cushions 74, which may also be referred to as first and second upper support pads. The lumbar cushion 72 is positioned to engage the lumbar region 78 of the back 22 of the wearer 24 (see Figure 6).  
30 Referring to Figure 3, when the backpack 20 contains a load, such as the load 30, the horizontal offset of the load 30 from the location of the support for the backpack 20, i.e., the middle of the shoulders 80 of the wearer 24.

will cause the backpack 20 to exert a moment on the back, and in turn a force against the back 22, particularly in the lumbar region 78. Furthermore, the curvature of the back 22 in the lumbar region 78 is such that the lumbar region 78 may itself provide some portion of lifting support for the load 30 in the backpack 20. Referring to Figure 6, the lumbar cushion 72 distributes any forces that are exerted against the lumbar region 78 over a larger surface area on the back 22, as illustrated by the arrows indicating a distributed force F4. By distributing any forces over a larger surface area, the lumbar cushion 72 relieves any point pressure that might otherwise be exerted on any portion of the lumbar region 78 and thus makes the backpack more comfortable to wear.

**[0030]** The two upper pads 74 distribute any forces and relieve any point pressures exerted by the backpack 20 against the mid-to-upper back region of the back 22, which is shown at 82. The distributed forces are shown as F5 in Figure 6. In particular, the upper pads 74 distribute forces in the shoulder blade regions 84 of the back 22, which can be particularly boney and thus sensitive to point pressures. Furthermore, the shoulder blade regions 84 are prone to incurring point pressures from the backpack 20 as the shoulder blades protrude from the back 22 during arm movement by the wearer 24.

**[0031]** Referring to Figure 7, the upper pads 74 and the lumbar pad 72 may be covered by a covering layer 86 that is an open mesh, and may be made sufficiently porous, eg. by use of material having an open cell foam structure, to promote further airflow onto the back 22, in addition to the air channels 58 and 60. Thus, even the portions of the backpack 20 that are in direct contact with the back 22 of the wearer 24 can facilitate evaporation of any perspiration, and can thus inhibit a buildup of heat and moisture on the back 22.

**[0032]** The upper pads 74 and the lumbar pad 72 may together define the first and second channels 58 and 60, as shown in the figures. Furthermore, the upper pads 74 and the lumbar pad 72 may be the only

portions of the back-facing face 32 that engage or contact the back 22 of the wearer 24.

5       **[0033]**       Reference is made to Figure 4. The backpack 20 may include a back board 88 on the back-facing face 32, and a bottom board 90 on the bottom face 38. The back board 88 provides some structural support for the backpack 20 and inhibits the backpack 20 from sagging during usage. The back board 88 also dissipates point pressures that might otherwise be exerted on the back 22 of the wearer 24 from such things as corners of objects being carried therein. The back board 88 may be made from a semi-rigid material such as polyethylene sheet of a suitable thickness. The back board 88 may be connected to the back-facing face 32 in any suitable way. For example, the back board may be captured between a covering layer of material 92 and the outer layer of the back facing face 32, which is shown at 94.

15       **[0034]**       The bottom board 90 provides support for a load within the backpack 20, and inhibits sagging of the backpack 20 during usage. The bottom board 90 and the bottom face 38 of the backpack 20 are configured so that they are both angled upwards in a direction away from the back 22. This configuration is maintained even during usage when carrying a load, at least in part by the generally trapezoidal shape of the side profile of the backpack 20. As can be seen in Figures 3 and 6, this configuration maintains the load 30 in close relation to the back 22 of the wearer 24. Thus, the overall distance from the center of mass of the load 30 to the center of the shoulders 80 of the wearer 24 is kept relatively low (see Figure 3), compared to a backpack 10 of the prior art which can sag, causing the load to move away from the back of the wearer (see Figure 1). The distance from the load 30 to the center of the shoulder 80 is  $D2+Ds$ .  $Ds$  is simply the distance between the back of the wearer and the center of the shoulder 80 and thus remains the same for a given wearer.  $D2$ , however, is smaller than  $D1$  because the backpack 20 maintains the load 30 relatively close to the back 22 and thus reduces moments exerted on the back 22 and reduces stresses overall on the wearer 24.

**[0035]** Referring to Figure 3, the shoulder straps 27 on the backpack 20 are used to support the backpack 20 on the shoulders 80 of the wearer 24. The shoulder straps 27 each extend between a first end point 96 proximate the top 44 of the back-facing face 32 and a second end point 98 on one of the sides 48 and 50 respectively, proximate the bottom 46. The shoulder straps 27 may be padded, particularly along portions thereof that are in contact with the shoulders 80 of the wearer 24. The shoulder straps 27 may further be covered by a covering layer 100 (see Figure 7a) that is an open mesh, and may be made sufficiently porous, eg. by use of material having an open cell foam structure, to permit some airflow to the portions of the shoulders 80 covered thereby, to inhibit a buildup of moisture from perspiration on the covered portions of the shoulders 80 by facilitating the evaporation of the moisture.

**[0036]** Referring to Figure 7a, the shoulder straps 27 preferably include length adjustment means of any suitable kind, such as a length adjustment buckle 102, which may be positioned towards the bottom of the shoulder straps 27. It will be appreciated that with the length adjustment buckle 102, the shoulder straps 27 are each made up of two separate strap pieces which are connected together by the length adjustment buckle 102.

**[0037]** The shoulder straps 27 may be contoured so that they are adapted to rest flatly on the shoulders 80 of the wearer 24 (see Figure 3), and remain generally flat on the body of the wearer 24 along the entire length of contact therewith. Thus, the shoulder straps 27 may have complex curvature, instead of extending generally linearly.

**[0038]** Referring to Figure 7a, to further maintain the shoulder straps 27 in flat relation to the body of the wearer 24, the shoulder straps 27 may attach to the second end points 98 by means of triangular tabs 104. The triangular tabs 104 permit the shoulder straps 27 to attach at a selected angle to the back-facing face 32. The angle is selected so that they shoulder straps 27 incur little or no twisting as they extend upwards and come into contact with the body of the wearer 24 (see Figure 3), thus inhibiting any point pressure on the body of the wearer 24. It is alternatively

possible for the triangular tabs 104 to be omitted and for the shoulder straps 27 to attach directly to the sides 48 and 50. In that alternative, the shoulder straps 27 may be cut at an appropriate angle across their widths, so that they extend upwards at a similar angle from the back-facing face 32 as occurs using the triangular tabs 104.

**[0039]** The backpack 20 may further include a sternum strap 106 that extends generally horizontally across the sternum of the wearer 24 (see Figure 3), between the shoulder straps 27. The sternum strap 106 may be height adjustable on each of the shoulder straps 27 to accommodate wearers of different heights and body shapes.

**[0040]** The sternum strap 106 may be length adjustable by means of a combined length adjustment buckle and clip 108. The combined length adjustment buckle and clip 108 provide both length adjustment for the sternum strap 106 and also permit the sternum strap to be separated into its two constituent portions for removal and donning of the backpack 20.

**[0041]** The sternum strap 106 prevents the shoulder straps 27 from spreading apart from each other, and accordingly inhibits the backpack 20 from slipping backwards off the back 22 of the wearer 24 (see Figure 3). Slipping that occurs in backpacks of the prior art moves the load contained therein farther away from the back of the wearer and thus increases the stress incurred by the wearer during usage.

**[0042]** Referring to Figure 7a, the backpack may also include a waist strap 110. The waist strap 110 may extend between end points 112 on the sides 48 and 50 respectively of the back-facing face 32, proximate the bottom 46. The waist strap may be length adjustable and separable into its two constituent pieces by means of a combined length adjustment buckle and clip 112, which may be similar to the combined length adjustment buckle and clip 108 that is part of the sternum strap 106.

**[0043]** The waist strap 110 maintains the bottom end of the backpack 20 in close relation to the back 22 of the wearer 24 (see Figure 3). Thus the waist strap 110 keeps the load 30 close to the back 22 and thereby keeps

the stresses on the back 22 caused by the load 30 relatively low (see Figure 3).

5     **[0044]**       The backpack 20 may further include shoulder cinch straps 114 and side cinch straps 115. The cinch straps 114 and 115 further assist in maintaining the load 30 close to the back 22 of the wearer 24 (see Figure 3), and further inhibit the backpack 20 from sagging.

10    **[0045]**       Referring to Figure 7a, the two shoulder cinch straps 114 each extend generally between a first end point 116 on the top 36 of the backpack 20 and a second end point 118 on the shoulder straps 27. The first end point 116 is preferably spaced from the top 44 of the back-facing face 32. Preferably, the first end point 116 is positioned at least partway towards the away-facing face 34 (see Figure 3) of the backpack 20. Positioning the first end point 116 closer to the away-facing face 34 permits the wearer 24 to more effectively cinch the backpack 20 and prevent the  
15    backpack 20 from sagging.

20    **[0046]**       Referring to Figure 7a, the shoulder cinch straps 114 are length adjustable for adjustment of the amount of cinching on the backpack 20, and may also be separable into two constituent pieces. The length adjustability and the separability of the shoulder cinch straps 114 may be provided by a combined length adjustment and clip 120.

**[0047]**       In the embodiment shown, the shoulder cinch straps 114 extend over the zipper 29 that provides access to the compartment 28. By permitting the shoulder cinch straps 114 to separate, access is improved into the compartment 28 for loading and unloading.

25    **[0048]**       The shoulder cinch straps 114 may have strap ends 122 that extend from one of the strap pieces down along the shoulder straps 27. Their positioning on the shoulder straps 27 enables the strap ends 122 to be pulled while the backpack 20 is being worn, to increase the amount of cinching of the backpack 20.

30    **[0049]**       The side cinch straps 115 are positioned along the sides 40 and 42 of the backpack 20, in between the top 36 and bottom 38. The side cinch straps 115 are each length adjustable and separable by means of a

combined length adjustment and clip 124. Since the side cinch straps 115 extend over the zipper 29, the separability permits improved access to the compartment 28.

5       **[0050]**       The side cinch straps 115 extend downwards in a direction towards the away-facing face 34 of the backpack 20. By extending in this direction, cinching of the straps 115 lifts the portion of the backpack 20 that is farthest from the back 22, ie. proximate the away-facing face 34. This, in turn, inhibits the backpack 20 from sagging during use when carrying a load.

10       **[0051]**       In an alternative embodiment that is not shown, the side cinch straps 115 may be generally horizontal instead of extending downwards in a direction towards the away-facing face 34.

15       **[0052]**       It will be appreciated that for embodiments where the shoulder and side cinch straps 114 and 115 do not cross over the zipper 29 that provides access to the compartment 29, the shoulder and side cinch straps 114 and 115 are not required to be separable, and thus may incorporate length adjustment buckles instead of combined length adjustment buckles and clips.

20       **[0053]**       The backpack 20 has been described as having two shoulder straps 27. It is alternatively possible, though not preferable, for the backpack 20 to include a single shoulder strap, which could, for example pass over a shoulder of the wearer 24 and cross diagonally over the front of the wearer 24, to join the backpack 20 at the bottom of the opposite side of the back-facing face 32.

25       **[0054]**       While the above description constitutes the preferred embodiments, it will be appreciated that the present invention is susceptible to modification and change without departing from the fair meaning of the accompanying claims.